REMARKS

Claims 1-46 are pending in the application. Claims 1-15 and 17-46 were rejected. Claim 16 is objected to as allowable if amended into independent form.

In the Final Office Action of June 6, 2005 and Advisory Action of September 14, 2005, Claims 1-3, 9, 20, 29, 44, and 46 were rejected pursuant to 35 U.S.C. §103(a) as being obvious over Roth (U.S. Patent No. 5,315,512) in view of Urbano et al. (U.S. Patent No. 5,976,088) or Hossack et al. (U.S. Patent No. 5,924,991). Claims 2 and 33-35 were rejected pursuant to 35 U.S.C. §103(a) as being unpatentable over Roth in view of Urbano et al. or Hossack '991, and in further view of Mo et al. (U.S. Patent No. 6,012,458). Claim 4 was rejected pursuant to 35 U.S.C. §103(a) as being unpatentable over Roth in view of Urbano et al. or Hossack '991, and in further view of Hoff et al. (U.S. Patent No. 6,315,730). Claims 5-8, 10-11, 21-28, 30, 36, 38-43, and 45 were rejected pursuant to 35 U.S.C. §103(a) as being unpatentable over Roth in view of Urbano et al. or Hossack '991, and in further view of Ramamurthy et al. (U.S. Patent No. 5,846,202). Claim 12 was rejected pursuant to 35 U.S.C. §103(a) as being unpatentable over Roth in view of Urbano et al. or Hossack '991 and in further view of Ramamurthy et al. and Hoff et al. Claims 13 and 32 were rejected pursuant 35 U.S.C. §103(a) as being unpatentable over Roth in view of Urbano et al. or Hossack '991, and further in view of Ramamurthy et al. and Holupka (U.S. Patent No. 5,810,007). Claims 14-15 and 17-19 were rejected pursuant to 35 U.S.C. §103(a) as being unpatentable over Roth, Urbano et al. or Hossack '991, and further in view of Greer et al. (U.S. Patent No. 5,959,622). Claim 31 was rejected pursuant to 35 U.S.C. §103(a) as being unpatentable over Roth in view of Urbano et al. or Hossack '991., further in view of Ramamurthy et al., and further in view of Hossack et al. (U.S. Patent No. 6,042,545). Claim 37 was rejected pursuant to 35 U.S.C. §103(a) as being unpatentable over Roth in view of Urbano et al. or Hossack '991, further in view of Ramamurthy et al., and further in view of Hoff et al.

Claims 1, 2, 4, 5, 21, 29, 31, and 41 have been amended. Claims 3 and 38 have been cancelled.

Applicants respectfully request reconsideration of the rejections of claims 1-15 and 17-46, including independent claims 1, 21, and 29.

Independent claim 1 was rejected pursuant to 35 U.S.C. §103(a) as being obvious over Roth in view of Urbano et al. or Hossack '991. Independent claim 1 recites a processor operative to recognize one or more non-cyclical distinguished events and to select a portion of an ultrasound examination based on the recognition of the one or more distinguished events. The recognition of the one or more non-cyclical distinguished events is based on analysis by the event recognition processor of ultrasound image data sets of the ultrasound examination.

Roth generates a data set for three-dimensional imaging (col. 2, lines 21-28). Data is selected from an original full examination (col. 2, lines 60-64 and col. 6, lines 33-43). ECG and respiratory readings are used to gate or select specific frames of data from the full examination (col. 4, lines 52-60). The ECG data is examined to identify cycles with a desired length at an appropriate portion of the breathing cycle (col. 7, lines 23-30). The ECG data is then used to select data at an appropriate phase of the heart cycle (col. 7, lines 31-37). See col. 10, lines 49 - col. 11, line 6. Because both ECG and breathing data represents repeating cycles, Roth uses repeating cycle information to select images for 3D reconstruction. As noted by the Examiner, Roth does not recognize non-cyclical distinguished events. Additionally, Roth relies on ECG and respiratory readings to select images, so Roth does not suggest using ultrasound information or image data. Roth does not disclose event recognition based on analysis by a processor of ultrasound image data sets.

Urbano et al. obtain a single pre-contrast image and a single post-contrast image at a predetermined point of interest in cardiac cycles (col. 18, line 67 – col. 19, line 4). The event to trigger acquisition is a QRS or heart cycle timing signal (col. 18, lines 60-67). Two images from two cycles are acquired based on a trigger corresponding to a regular or cyclical event in the cardiac cycle. Because Urbano et al. acquire at a predetermined point of interest (e.g. R wave), a cyclic distinguishing event is used. The pre- and post- contrast images are the result of triggering in different cycles, not of active triggering. Thus, Urbano et al. do not show the processor distinguishing between these two pre- and post- contrast events, but instead use heart cycle timing. Because Urbano et al. use a cyclical predetermined trigger to acquire the images, Urbano et al. do not use a non-cyclic distinguishing event. Additionally, Urbano et al. rely on the heart cycle timing signal for identifying an event. Urbano et al. do not use image analysis to identify an event. There is no disclosure of how to trigger the pre- verses post- contrast agent

portion of the criteria, but manual activation is one possibility. Urbano et al. do not disclose event recognition based on analysis by a processor of ultrasound image data sets.

Hossack '991 disclose several alternatives for breath gating (col. 10, line 67 – col. 11, lines 6). In one, chest motion is used for cyclic gating (col. 11, lines 3-5). In another, nostril air temperature is detected for cyclic gating (col. 11, lines 5-6). The chest motion and nostril temperature embodiment detect cyclical events, not a non-cyclical distinguished event. Another alternative is to simply have the patient hold their breath during the ultrasound scan (col. 11, lines 1-3). The alternative of simply holding the breath does not have a processor detect any event. The patient is asked to hold their breath, and then the scan is performed. Thus, Hossack '991 does not disclose a processor operable to recognize a non-cyclical distinguished event. Additionally, Hossack '991 does not suggest analysis of ultrasound data by the processor to identify an event. Simply holding the breath and then imaging is not analysis of ultrasound image data sets.

In summary, Roth, Urbano et al., and Hossack '991 fail to disclose a processor operable to recognize a non-cyclical distinguished event. The non-cyclical events of the cited references are silent about processor based implementation and likely rely on manual activation (e.g., manual trigger prior and after contrast agent injection or manual scanning once the patient holds their breath). Roth, Urbano et al., and Hossack '991 also fail to disclose the recognition of distinguished events based on analysis by the event recognition processor of ultrasound image data sets. The cited references use ECG or breathing monitor information, not ultrasound image data sets. Pre- verses post- contrast agent or when holding breath criteria for selection are not indicated as performed by a processor and are not indicated as being based on analysis of ultrasound image data sets. There is no suggestion to recognize with a processor an event based on analysis of ultrasound image data sets.

Independent claim 29 was rejected pursuant to 35 U.S.C. §103(a) as being obvious over Roth in view of Urbano et al. or Hossack et al. Similar to claim 1, claim 29 recites inputting data to an event recognition processor and processing whether a non-cyclical distinguished event has occurred. As discussed above for claim 1, Roth, Urbano et al. and Hossack '991 use cycle

information to select data, not a non-cyclical event. Non-cyclical events of Urbano et al. and Hossack '991 are not disclosed as being part of processing.

Also similar to claim 1, claim 29 recites reviewing the sequence of image data sets and determining, as a result of the review of the sequence of image data sets by the event recognition processor, whether a non-cyclical distinguished event has occurred. As discussed above, Roth, Urbano et al., and Hossack '991 use ECG, breath gating or other non-detailed (e.g., manual) techniques to determine an event, and thus do not disclose determining an event by reviewing image data sets by a processor.

Independent claim 21 was rejected pursuant to 35 U.S.C. §103(a) as being unpatentable over Roth in view of Urbano et al. or Hossack '991 and in further view of Ramamurthy et al. Independent claim 21 recites automatically recognizing from image analysis and marking or storing non-repeating subsets of an examination where the one or more non-repeating subsets are bracketed by one or more pairs of distinguished events determined as a function of the image analysis.

Roth uses cycle or repeating information to select data. Similarly and even as noted by the Examiner, Ramamurthy et al. use repeating triggers (see Figs. 2B, 3B and 4B-D). Thus, Roth and Ramamurthy et al. use repeating gating or triggers.

Urbano et al., as discussed above, detect two cyclical events. To acquire the two images (pre-contrast and contrast), heart cycle gating is disclosed. The trigger events are repeating heart cycle triggers, so Urbano et al. do not disclose marking or storing non-repeating subsets bracketed by distinguished events.

Hossack '991 use repeating breath gating or merely avoid detecting events by having the patient hold their breath. Hossack '991 do not disclose marking or storing non-repeating subsets bracketed by distinguished events.

As discussed above for claims 1 and 29, Roth, Urbano et al. and Hossack '991 do not disclose recognizing from image analysis or distinguished events determined as a function of the image analysis. Ramamurthy et al. use repeating triggers determined from EKG, phonocardiogram, pressure wave, pulse wave, respiratory signal, pulse wave or continuous wave Doppler, m-mode strip display, or physio recording devices (col. 13, lines 45-56). While pulse

wave or continuous wave Doppler information or m-mode strip display information may be ultrasound image data, Ramamurthy et al. do not indicate how the Doppler or m-mode information is used for triggering or whether the information is part of the examination for marking or storing. Ramamurthy et al. do not disclose recognizing from image analysis or distinguished events determined as a function of the image analysis of the ultrasound examination.

Applicants respectfully submit that a person of ordinary skill in the art would not have used the disclosures of Ramamurthy et al. with Roth. Roth collects a fully sampled set of data for later decimation or gating to identify the desired fames (col. 9, lines 5-16). Roth specifically discloses retrospective selection as desired (col. 6, lines 34-36; col. 7, lines 31-37; and col. 9, line 11-16). Conversely, Ramamurthy et al. trigger acquisition so that data is only acquired at certain times (col. 6, lines 1-7; col. 6, lines 42-56) or so that a parameter is varied at different times (col. 8, lines 47-62). Ramamurthy et al. trigger during acquisition to improve cardiac function detection (Col. 2, lines 35-40), and so teach corresponding processes. Roth instead teach retrospective gating or selection. A person of ordinary skill in the art would not have used the acquisition based triggering and associated disclosure of Ramamurthy et al. with the systems and method of Roth adopted to select from or gate a fully sampled previously acquired examination.

Dependent claims 2, 4-20, 22-28, 30-37, and 39-46 depend from the independent claims 1, 21, and 29 discussed above, and are thus allowable for at least the same reasons as the corresponding independent base claim. Further limitations distinguish over the reference or references used to reject the dependent claims.

For example, claim 2 has been previously amended in the Office Action Response and Amendment of February 22, 2005 to correct antecedent basis. The Examiner premises the rejection on a lack of antecedent basis and manual operation in Roth. Roth, Urbano et al. and Hossack '991 do not disclose recognition by a processor of a stationary probe by analyzing image data sets.

In recognition of the disclosure of Roth for claim 2, the Examiner rejected claims 2 and 33-35 over the further reference of Mo et al. Claims 2 and 33-35 recite a distinguished event based on an absence of motion. Mo et al. discard interpolated frames (col. 5, lines 35-55).

Motion is not used to distinguish an event based on analysis of image data sets. Additionally, Mo et al. also do not suggest reviewing motion in an image to identify an event as claimed in claim 35.

Claims 4, 12, and 37 recite determining a distinguished event based on a rate of change of brightness. Hoff et al. was cited for this disclosure. Hoff et al. disclose deriving wash-in curves from second harmonic intensities (col. 7 lines 20-24). A plot showing a rapid rise in backscatter may be generated (col. 8, lines 14-18). Hoff et al. merely plot a curve, but do not suggest determining an event based on a rate change. The Examiner relies on the motivation of associating the wash-in curve with ECG triggering to identify hypo-perfused cardiac tissue. Roth, Urbano et al. and Hossack '991 do not disclose processor based image data set analysis for a distinguished event. Hoff et al. plot a wash-in or out curve. There is not teaching or suggestion to use wash-in by a processor as a distinguished event. Also, a person of ordinary skill in the art would not have used the trigger based acquisition of Hoff et al. (col. 7, line 17) with the full acquisition and later gating of Roth for the reasons discussed above regarding Ramamurthy et al.

Claim 5 recites recognizing a jet in color Doppler as an event. Ramamurthy et al. use color Doppler imaging, but do not show a processor to recognize a jet. The highest velocity mapping alone does not identify a jet event, but only results in an image of the highest velocities where the highest velocities may or may not be associated with a jet.

Claim 39 recites an event based on a rate of change of velocities. Ramamurthy et al. identify a highest velocity, but not a rate of change.

Claims 13 recites a cropping factor based upon characterization of an image. Holupka et al. crop automatically or manually with a special mask (col. 6, lines 19-28). Holupka et al. do not suggest a cropping factor or a cropping factor based on characterization of an image.

Regarding claims 14-15 and 17-19, applicants respectfully submit that a person of ordinary skill in the art would not have used the feedback of Greer et al. in the system of Roth. Roth identifies images after an exam, and thus does not need the feedback. Roth also generally identifies one image every heart cycle or few heart cycles. The feedback of Greer et al. would be provided at the same frequency. Such frequent feedback, such as beeps or visual flashes, would

be distracting and undesired in a medical environment absent an emergency. Thus a person of ordinary skill in the art would not have used the feedback of Greer et al. with Roth.

Claim 31 recites selecting a subset of image data sets with decimation. Hossack '545 decimates within a given image (col. 7 lines 56-58), not decimation of image data sets.

CONCLUSION

Applicants respectfully submit that all of the pending claims are in condition for allowance and seeks early allowance thereof. If for any reason, the Examiner is unable to allow the application but believes that an interview would be helpful to resolve any issues, he is respectfully requested to call the undersigned at (650) 943-7350 or Craig Summerfield at (312) 321-4726.

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